



8 November 2023

SAFETY WEBINAR

Objects left on
the Line

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INTERNATIONAL UNION
OF RAILWAYS

How can we minimise large animal incursions and collisions ?

How can we reduce incursions of large animals on the tracks and collisions of trains with animals?

To assess the problem, we need to know its scale and where to act in the first place



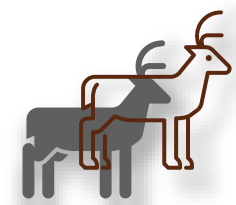
18 634 km railway lines



24 699 engineering structures



➤ 5 000 km railway lines in the area of ecological corridors



4 000 collisions with animals*

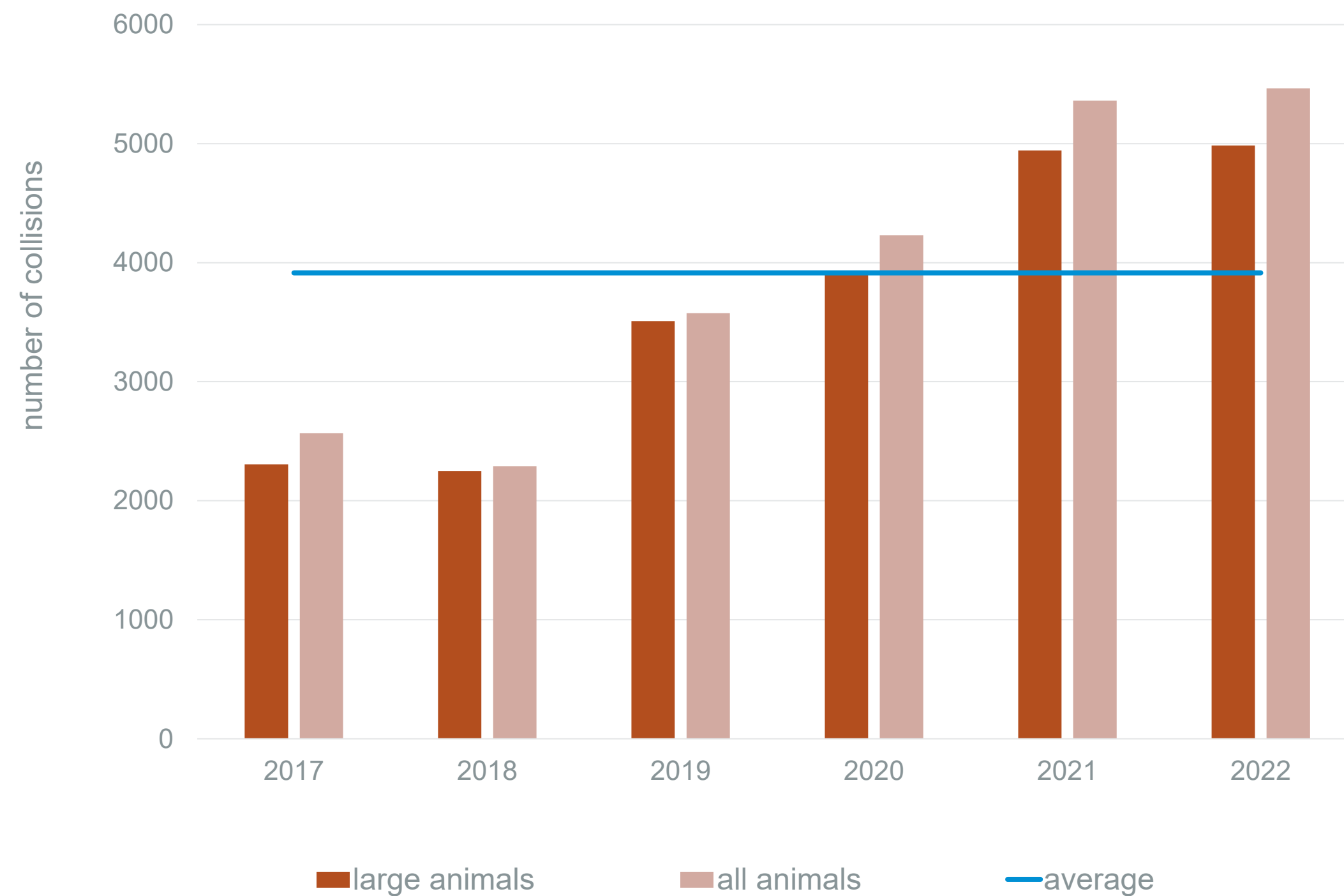


The map of ecological corridors in Poland was developed in 2005 (updated in 2012) by the Mammal Research Institute of the Polish Academy of Sciences in Białowieża, commissioned by the Ministry of Environment.

* Average of 2017 – 2022: 3915 collisions

Collisions of railway vehicles with animals

Number of collisions of railway vehicles with animals



On railway lines managed by PKP Polskie Linie Kolejowe S.A. (PLK S.A.), about 4,000 collisions with animals occur yearly

Collisions with large and medium animals (roe deer, wild boar, deer, European bison) account for 93% of all collisions

Data on collisions of railway vehicles with animals are collected in accordance with internal procedures of PKP Polskie Linie Kolejowe S.A.

How can we reduce incursions of large animals on the tracks and collisions of trains with animals?

- PLK S.A. has guidelines for estimating the risk of collisions of trains with animals as part of the risk assessment (specifying the required indicators and threshold values)

The guidelines are an element of the Safety Management System of PLK S.A.

Methodology of estimation of the risk of collisions of trains with animals is based on the following indicators:

- number of collisions
- maximum speed
- traffic volume



Result - list of sections of the lines where appropriate action needs to be implemented



- PLK S.A. has standards specifying detailed technical conditions for the modernisation or construction of railway lines

Along railway lines where the design speed is **V>200 km/h**, fencing should be used in areas where unauthorised persons and wild or domestic animals are likely to cross the tracks

The standards also include a decision model for determining the need for fencing the remaining lines. The assessment depends, among others, on the number of collisions, maximum speed, and traffic volume



How can we reduce incursions of large animals on the tracks and collisions of trains with animals?

Methods of reducing collisions of trains with animals used on the PKP Polskie Linie Kolejowe S.A. network (depending on conditions and capability)

- Removal of vegetation along railway lines
- Regular removal of dead animals from the tracks
- Track fencing
- Ecopassages:
 - for large animals (upper above the railway line and lower combined with the watercourse)
 - for medium animals (bridges and viaducts - with the soil and vegetation where necessary)
 - for small animals (culverts - shelves where necessary)
- Animal deterring device UOZ



A number of studies, monitoring and analyses carried out along railway lines indicate that railway lines are not barrier to animal migration – a serious matter is railway safety

Animal deterring device (UOZ)



The devices emit acoustic signals - warning sounds that take advantage of the existing mechanism - genetically programmed fear of natural predators and other dangers

These signals are emitted by UOZ for a specified period of time before the train passes



The complete system consists of device installed at the track and cooperating control modules installed in UOZ containers

The device is attached to a concrete foundation in the substructure (in the line of traction poles) alternately on both sides of the tracks, every 70 meters

The devices are equipped with a diagnostic system to remotely detect and locate any malfunctions

Animal deterring device

UOZ – design

The devices that have been installed so far cooperate with automatic line interlocking modules. They do not have their own sensors to read information about the approaching train and its speed. On each section of the railway line, the devices have been individually set to the speed of the fastest or most frequent trains on the section.

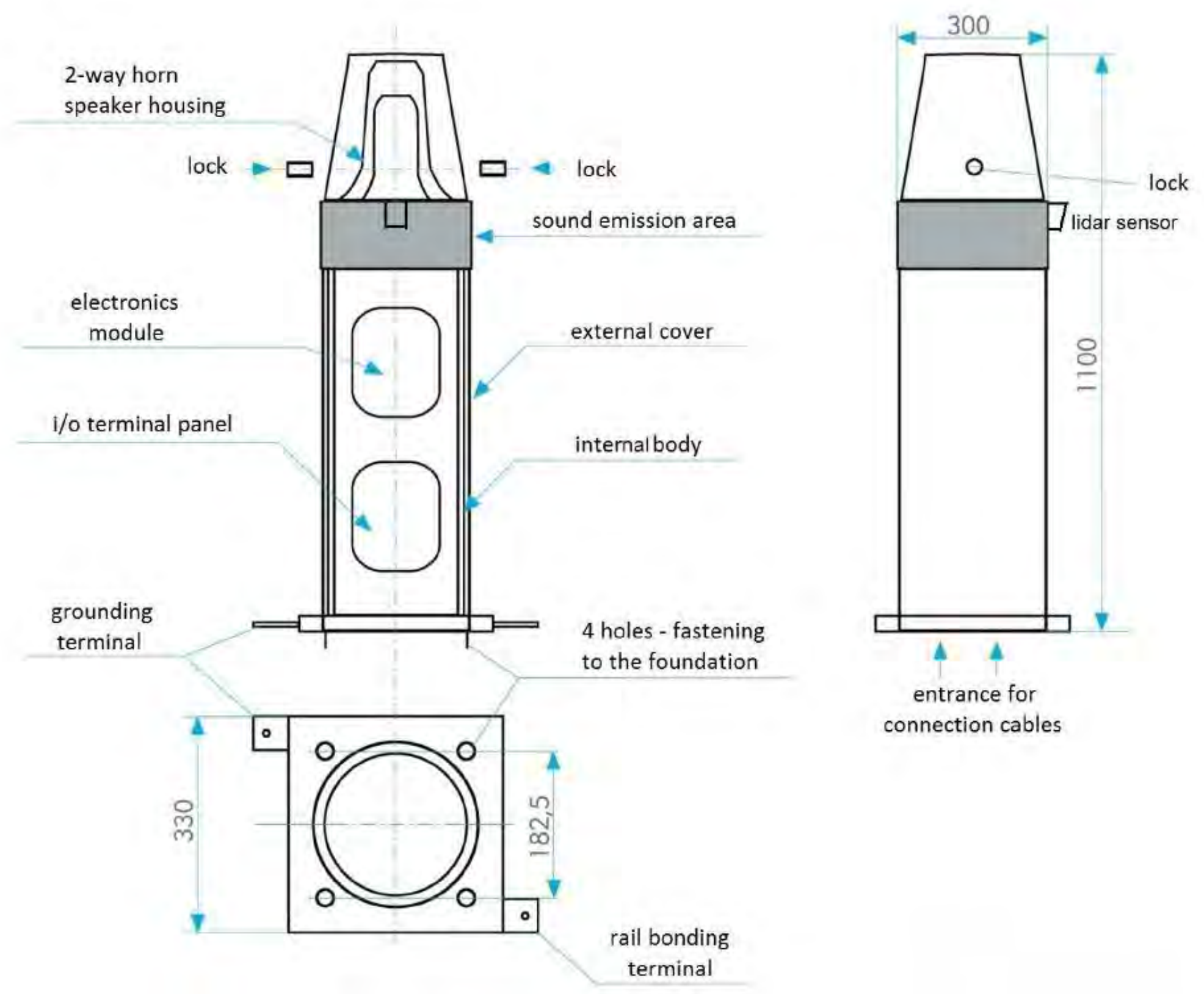
The system is being improved, including installation of additional wheel, lidar, and seismic sensors to avoid :

- premature start and end of a signal - in case the train is moving slower than it was programmed in UOZ
- late activation of the signal for trains travelling faster than the speed for which the UOZ was programmed (UOZ activated during or after the train has passed)

IT IS ESSENTIAL THAT ALL DEVICES IN A GIVEN SECTION FUNCTIONS PROPERLY



Animal deterring device

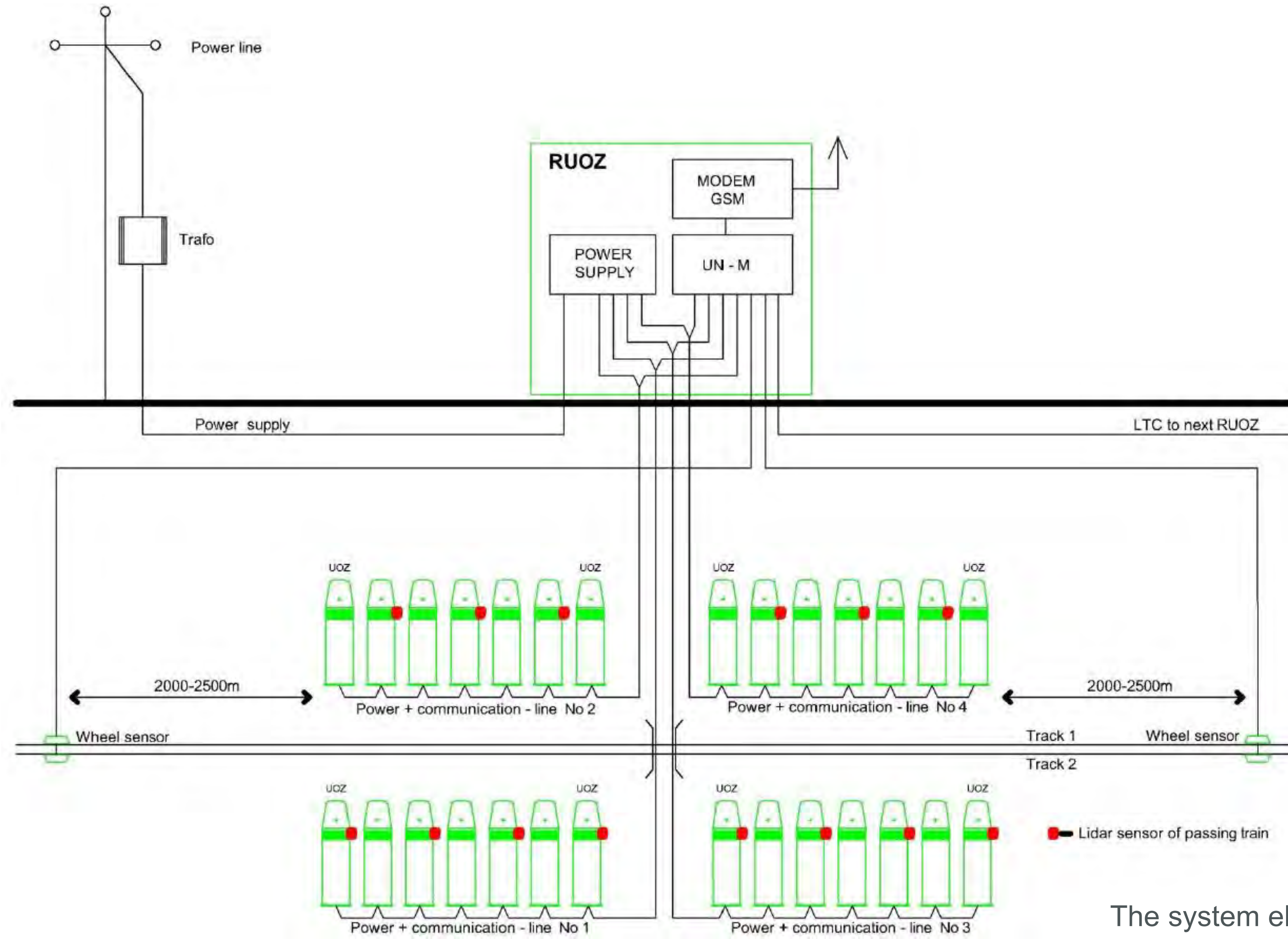


Technical specifications: The trackside UOZ device is designed for operation outside, within a temperate climate.

Weight of the UOZ device	290N (~28 kg)
Weight of the foundation	1.85kN (~180 kg)
Protection (IP code)	IP 65
Power supply	230 VAC, (separated voltage)
Nominal current	$I_n = 0.12A$
Nominal power consumption in standby mode	5VA, $\cos\phi > 0.6$
Maximum power consumption during sound emission	20VA, $\cos\phi > 0.7$
Overcurrent protection type	C2 type installation switch
Test voltage (insulation)	4000 V RMS
Digital data transmission	RS485
Transmission speed	9600-19200 baud
Emitted sound level 1kHz / 1m	~90dB (test signal)
Environmental temperature	-45°C to +55°C
Max. relative air humidity	100%
Type of operation	continuous operation

Activation of the trackside UOZ is based on information obtained from the railway traffic control system about the location of trains approaching and passing through the protection area

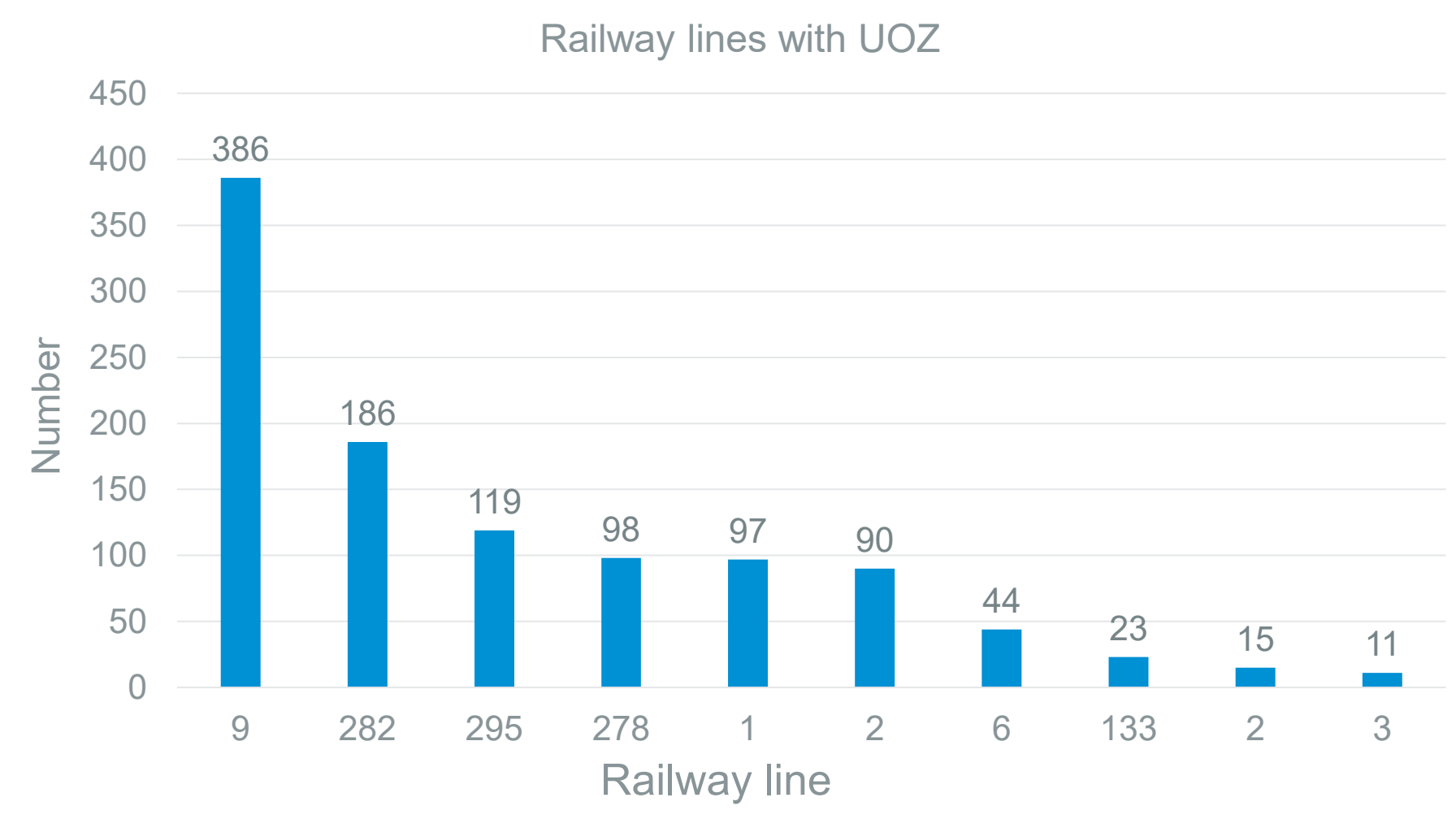
Animal deterring device



The system elements of UOZ - in green colour

Animal deterring device

There are currently 1,069 devices in operation on the Polish railway network

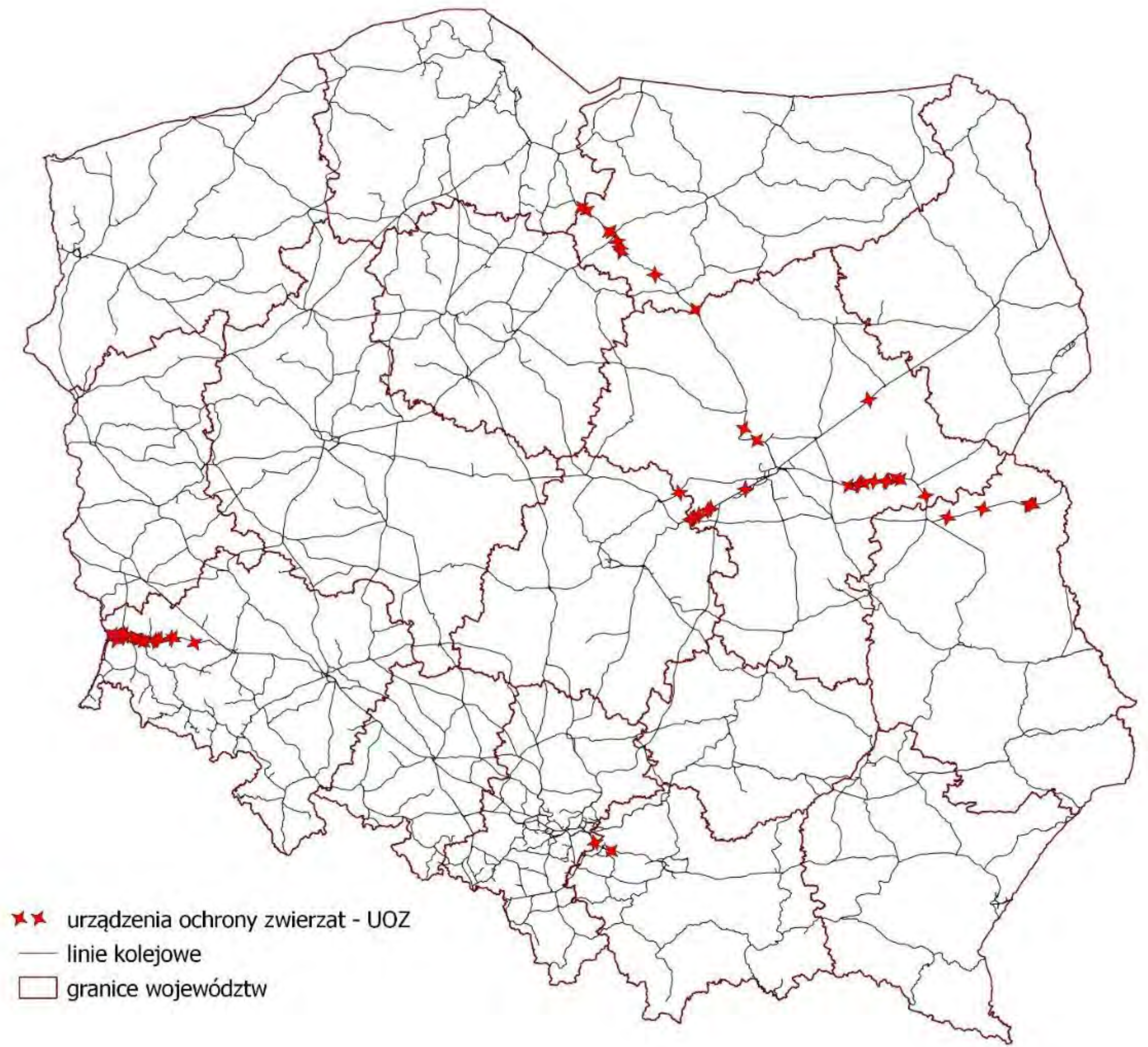


These devices are mainly installed as part of modernisation and renewals carried out on railway lines to minimise collisions of animals with trains



UOZ has been designed to counteract the migration of wildlife across the railway tracks during train passage at an assumed line speed of $V=160-200$ km/h

UOZ allows to reduce the loss of animal populations while not restricting free movement in their feeding grounds



Animal deterring device

Effectiveness of UOZ - studies



The first devices installed in Poland were subject to an effectiveness study conducted by the Warsaw University of Life Sciences (SGGW) on the E20 railway line between Mińsk Mazowiecki and Siedlce between 2007 and 2013.

Due to modernisation of some lines, further UOZ were installed. In some cases, post-investment monitoring of the effectiveness of the applied UOZ was carried out.

The monitoring required by the decisions on environmental conditions was carried out for PLK S.A.



- "Reconstruction and extension (modernisation) of the E65 Warsaw - Gdynia railway line" - sections in Mazowieckie and Warmińsko-Mazurskie Voivodeships - railway line no. 9
- „Modernisation of the Warsaw - Łódź railway line, stage II, Lot A - section Warszawa Zachodnia - Miedniewice (Skierniewice)" - railway line no. 1
- "Modernisation of the E 30 railway line between Węglińiec and Legnica"
- "Modernisation of the E 30 railway line on the sections Węglińiec-Zgorzelec and Węglińiec - Bielawa Dolna - state border"



- research provided by SGGW
- monitoring of fulfilled projects (PKP PLK)
- railway lines
- ⋯ voivodeships

Animal deterring device

Effectiveness of UOZ

- ✓ UOZ does not entirely eliminate the problem of collisions of trains with animals
- ✓ Mortality rate in sections with UOZ is lower than in other sections
- ✓ Lower animal mortality was observed in the sections equipped with UOZ than in the sections without these devices, even though UOZ was installed in sections with high animal migration (2-3 times more animals than in other sections)
- ✓ Different animal behaviour was observed after UOZ had been installed – either staying around or escape
- ✓ When no escape occurred, in most cases the animals often raised their heads or stopped, listening - even though they were not frightened, they paid attention to the stimuli of their surroundings, becoming more attentive
- ✓ **Animals never attempted to cross the track while the device was in operation**

In recent years damage and theft of devices have been reported on some lines

In addition to damage caused by third parties on railway lines, there may be damage to cables, or damage during the removal and installation of devices for upgrades and repairs, etc.





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